Mathematical Modeling, Book 3
Teacher's Resource
Supplement

Introduction

This package has been developed by a team of classroom teachers who came together to discuss how best to address all of the Mathematics 12 and Advanced Mathematics 12 outcomes within the minimum time requirement of 110 hours and to develop materials to assist teachers in this regard. It has been adapted to reflect the changes to the Mathematics 12 and Advanced Mathematics 12 curriculums.

Description

The material in this package is designed to be inserted into the appropriate section of *Mathematical Modeling, Book 3: Teacher's Resource*. Each section of the supplement is on a new series of pages and can be inserted into the *Teacher's Resource* at the page indicated in the top right-hand corner. Each section in the supplement corresponds to a section in the student textbook, *Mathematical Modeling, Book 3*. Each section consists of a chart. Each row in the chart represents a given activity or group of questions. The rows have either a white or a grey background; white indicates that the activity is meant for all students and grey indicates the activity is recommended for students in Advanced Mathematics 12 only.

Every chart has three columns. The first column lists all the activities contained within the main body of the textbook. The second column lists the outcome(s) being addressed by the particular activity or group of questions. These outcomes are listed to make it easy to see that they are all being addressed by the suggested activities. The third column contains notes or suggestions that may help save class or preparation time.

Investigations, Focuses, Investigation Questions (IQ), Focus Questions (FQ), and Check Your Understanding questions (CYU) are the most common exercises listed in the first column of the chart. Most Investigations are recommended to be completed as indicated in the textbook; others include a note that the investigation is optional or a note or suggestion to change a particular aspect of it. Focuses are primarily information to be given to students that may be delivered using the teacher's own methods. See the notes beside each focus for more details.

IQs, FQs, and CYUs are listed in three different formats. If they are written in Univers 45 light, bold text (e.g., **1, 2, 3**), it is recommended that these questions be included to address the related outcomes.

Sample	**Explanation**
CYU **27**	Check Your Understanding question 27 is strongly recommended for all students.
CYU **28**	Check Your Understanding question 28 is strongly recommended for students taking Advanced Mathematics 12.

If question numbers are written in *italicized Garamond text (*e.g., *1, 2, 3),* they may be assigned if time permits. All outcomes can be addressed without completing the questions listed in this format.

Sample	*Explanation*
CYU *22*	Check Your Understanding question 22 is for all students and can be completed if time permits.

If a question number has a strike through it (e.g.,~~1, 2, 3~~), then we do not recommend this question. Questions are struck because they are problematic in some way.

Sample	*Explanation*
~~FQ~~ ~~*34, 35, 36, 37*~~	Advanced Mathematics 12 Focus Questions 34, 35, 36, and 37 are not recommended for students.

Additional Comments

It is important to note that the teachers involved in this project offer these recommendations as suggestions only, as they believe there are many different ways to approach curriculum delivery.

If you have any comments or suggestions about the material presented in this Supplement please contact Donna Karsten by email at karstend@gov.ns.ca.

Chapter One
Quadratics

Insert at Page 3

1.1 Number Patterns

Textbook Items	Outcomes	Notes/Suggestions
Investigation # 1	C4	
IQ *1*	C4, A7	
IQ **2, 3**, *4*, **5**, **6**	C4	
CYU **7, 8**	C4	
CYU **9 (a, c)**	C4	
CYU 10, 11	C4	
CYU **12, 13**	C4, C29	
CYU **14**, *15*	C4	
~~CYU~~ ~~*16*~~	C4	
Investigation # 2	C4	Change wording in Procedure A to ...Use diagrams to find the number of ways Alice and Beatrice can buy lunch from **2 outlets, 3 outlets, 4 outlets, and 5 outlets.**
IQ **17, 18, 19**	C4	
IQ **20 (a, b)**	C3	Change: Only necessary for students in Advanced Mathematics 12. Use TI-83 for this question.
IQ **21 (a)**	C4	
IQ **21**	C4	
CYU *22*	C4	
CYU **23 (a, b)**	C4, C3, C29	Do only two of the five equations.
CYU **23 (c, d)**	C4, C3, C29	Do six terms instead of ten.
CYU *24*, **25**	C4	
CYU **26**	C4	Do six terms instead of ten.
CYU **27**	C4	Do only one part of this question.

Textbook Items	Outcomes	Notes/Suggestions
CYU **28**	C4	Assign after CYU 27 is reviewed.
CYU **29, 30,** ~~*31*~~, *32*	C4	Q29(b) Do six terms.
CYU **33**	C4	Hint: Use $t_n = an + b$ $t_n = cn + d$
~~FOCUS A~~		
~~FQ~~ ~~*34, 35, 36, 37*~~		
CYU **39, 40**	C10Z	
CYU **41**	C10Z	Do this question in class as it does not have increments of one. Use finite differences or matrices to complete this question.
CYU **42**	C10Z	"Split Screen" feature on the TI-83 can be used for this question.
Chapter Project may be done using the same method as in CYU 41.		
Students may benefit from practising additional questions similar to CYU 41.		

1.2 Non-Linear Relationship and Function

Textbook Items	Outcomes	Notes/Suggestions
Investigation # 3	C1	
IQ *1, 2, 3, 4*	C1	Have students use TI-83 to check their answers.
CYU **5**	C3, F1	This is a good place to start this section. Good TI-83 practice: students get exposure to pictures and window setting. Ask students to determine domain and range throughout this section.
CYU *6*	C1	
CYU *7*	C1	
CYU **8 (a)**	C1	Use finite differences or matrices for this question.
CYU *8 (b)*	C1	
CYU **9**	C1	Use finite differences or matrices for this question.
FOCUS B	C29	It works well if each group does one and then shares with the class.
FQ **10, 11**	C1, F1, C29	Use TI-83 for these questions.
FQ **14, 15**, *12, 13, 16*	F1	
CYU *17*	C29	
Look at Chapter Project for this section, p. 23		
Investigation # 4 (Optional)	C8, C1, C3, F1	
IQ **18, 19**	A7	
CYU **20**, **21**, **22, 24**, *25*	C1	
CYU ~~*23*~~		

Textbook Items	Outcomes	Notes/Suggestions
CYU **26**	C1	Change: Only necessary for students in Advanced Mathematics 12. Find equations that describe the situation if the sum of the area of the two is to be a minimum. Hint: Start diagram in class before assigning for homework.
~~CYU~~ ~~*27*~~		The answer in the *Teacher's Resource* should be (-1, 0).

1.3 Properties of Graphs of Quadratics Functions

Textbook Items	Outcomes	Notes/Suggestions
Focus C	C31	Give this information using your own method. Cover answers to FQ 1–5.
CYU **6**	C31, C9	This question has many parts, select only enough to meet the needs of the students.
CYU **7**	C31	This question has many parts, select only enough to meet the needs of the students.
CYU **8**	C31, C32	This question is **important**. It is necessary to discuss the conclusions in class. Extension Question — *Pre-Calculus Mathematics One* by McKillop & Kelley, page 66, question 8.
CYU **9**, *10*, **11 (e)**	C31	
CYU **12**, *13*	C31	
Focus D	C9	Focus D is strongly recommended. Algetiles or other pictorial representations are necessary.
FQ *14, 15,* **16**	C9	
FQ **17 (a, b, e)**	C9, B1, A7, C31	Do an analysis of these equations: domain, range, max/min, vertex, transformations, line of symmetry, zeroes, independent, dependent, and mapping rule.
FQ *18*, **19**, **20**, *21*, **22**	C9	Q19 Use TI-83 to see pictures and set windows. Q20 Do some parts (e.g. c, e, and f) and do an analysis as above.
CYU **23 (b, e)**	C9	Ask for a mapping rule.
CYU **24**	C9	Change: Only necessary for students in Advanced Mathematics 12.
CYU *25*	C9	

Textbook Items	Outcomes	Notes/Suggestions
CYU **26**	C9	Ask students to determine the domain and range. Students may have different interpretations. The given answer is 11.2, but students could argue that 8.1 is correct.
CYU **27**	C9, C8	
CYU *28*	C9	Correction to TR: ...The area of the rectangle A is $3\left(\frac{800-4x}{6}\right)x = 400x - 2x^2$ ...
CYU **29**	C9, C8	
CYU *30*	C9	
CYU **31, 32 (a, b, e, f), 33**	C9	Suggested order: p. 72 Q4 / p.44 Q6 / p. 54 Q42–43 / p. 35 Q31 / p. 73 Q13 / p. 74 Q24
CYU **34**	C9	Use transformational form. Use the word "show" not "prove."
Focus E Method 1	C1	
Focus E Method 2	C1	At this point in the text book, the variables in the transformational form of the quadratic equation change from a, h, & k to k, q, & p. See key strokes for TI-83. Additional Resource — *Math is 6* by Ebos and Tuck
FQ *35, 36, 37, 38*	F1	
CYU **39**	B1	
CYU *40*	B1	Good question if students are strong with TI-83.
CYU *41*, 42 (d)	B1	
CYU **43, 44, 45**	C23	Do two of these three questions. This is a good time for a test.
Challenge P 35 a/b		Do this challenge on the board; it is not necessary to have students copy it into their scribbler.

1.4 Roots of Quadratic Equation

Textbook Items	Outcomes	Notes/Suggestions
Focus F	C22	Give this information using your own method. Use Algetiles for method 2. Clarification: The triangle, a visual representation of (S= d/ t), is used to help students rearrange the formula. In order to solve for a particular variable, cover the unknown variable. The remaining variables are arranged in operational position. Specifically, if you cover the (S) you get (d) over (t); so S= d/ t; if you cover the (t) you see (d) over (S); so t= d/ S; and if you cover the (d) you see (S) times (t); so d= St.
FQ *1, 2*	C22	
FQ **3**	C22	Change: Only necessary for students in Advanced Mathematics 12.
FQ **4 (b, d)**, *5*	C22	Question 5 might be good for homework
FQ **6, 7**	C22	
CYU **8, 9, 10**	C22	Do one or two of these questions.
CYU **11**	C22	
CYU **12**	C22	This question has many parts, select only enough to meet the needs of the students.
CYU **13**, *14*	C22	
CYU *15, 16*, **17 (a, b)** **18**, *19*	C22	To do # 18, it is strongly recommended that a speed/ distance/ time table be set up similar to that on page 88 of *Teacher's Resource*.
CYU **20**	C22	
CYU *21, 22*	C22	
Investigation # 5	B10	

Textbook Items		Outcomes	Notes/Suggestions
IQ	**23**	B10	Mathematics 12 students can do this with teacher. Advanced Mathematics 12 students should do this on their own. Use a numeric example and move to general case. Make sure student remembers addition of fraction.
IQ	**24**	B10	
IQ	**25**	B10	
IQ	**26, 27**	B10, B11Z	These questions have many parts, select only enough to meet the needs of the students.
IQ	*28*	B10	
IQ	**29**	B10	Rewording: "A **complex** number can be represented ..."
Did You Know?			Clarification: For instance, in electronics, capacitance and inductance in filters, tuners, and other alternating-current circuits can be represented as resistances, using complex numbers.
CYU	**30 (a, c, g)**	B10, C22, A9	
CYU	*31*, **32**	B10	Question 32 has many parts, select only enough to meet the needs of the students; including part (e).
CYU	**33**	C15	
Focus G		C22	Teach this your own way.
FQ	**34, 35 (a), 36 (a)**	C22	
CYU	**37**, **38**, *39*	C22, B10	
CYU	**40**	C22, B10	Use TI-83.
CYU	*41*	C22, B10	
CYU	**42, 43**	C22, B10	

1.4 Roots of Quadratic Equation

Textbook Items	Outcomes	Notes/Suggestions
CYU **44, 45**	C22, B10	
CYU **46, 47**	C22, B10	
CYU **48 or 49**	C22, B10	
CYU *50*	C22, B10	Change: For students in Advanced Mathematics 12.
Investigation # 6	A4	Procedure A — Number the equations. Put in TI-83. If students are working in groups, one question can be assigned to each group and then shared with the class.
IQ *51, 52*, **53**, *54, 55*	A4	
CYU **56, 57**, *58, 59*	B10, C22	
CYU **60**	B10, C22	Do it four ways.
CYU **61**	A4	Change: Only necessary for students in Advanced Mathematics 12.
CYU **62, 63, 64**	A4	
Investigation # 7		There are no SCOs that match this activity.
IQ *68–72*		There are no SCOs that match these question.
Chapter Project		
Case Study 1		Part (c) Correction — ... quadratic function in part **(a)** is negative. Omit Part (g).
Case Study 2		
Case Study 3		Makes a good assignment, if your students explain the math as they go.

Chapter Two

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Rate of Change

2.1 Describing Rate of Change *(Optional)*

Textbook Items	Outcomes	Notes/Suggestions
Investigation # 1	*C17*	
IQ ***1, 2, 3***	*C17, B4, C30*	
IQ ***4, 5***	*C17, B31*	
CYU ***6***	*C17, B4*	
Focus A	*C17, C16, C30*	
FQ *7, 8, 9*	*C8, C16, C17, C16, C30*	*There are many questions in this section, select only enough to meet the needs of the students.*
FQ *10, 11, 12*	*C10, B4, C17, C30, B4*	
CYU *13, 14, 15*	*C17, B4, C16*	
CYU *16, 17, 18*	*C16, C30, C17, B4*	
CYU *19, 20, 21*	*C17, C4, C30, C16*	
CYU ***22, 23****, 24, 25*	*C17, B4, C30, C16*	
Chapter Projects	*C17*	

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2.2 Describing Instantaneous Rate of Change *(Optional)*

Textbook Items	Outcomes	Notes/Suggestions
Investigation # 2	*C18, C16, C27*	*Do not do procedure A. Demonstrate on an overhead or give on a handout with all the graphs from Mr. Lam's trip.*
IQ ***1, 2****, 3*	*C1, C28, C16, C17*	
IQ ***4, 5, 6***	*C27*	
CYU ***7, 8***	*C27*	
Focus B	*C18*	*Follow-up Activity: Geometry Sketch Pad tan line demonstration.*
FQ ***9, 10,*** *11*	*C21, C18, C30*	
FQ *12, 13*	*C27, C18*	
CYU ***14, 15, 16***	*C28, C18, C30*	
CYU ***17, 18, 19***	*C28, C18, C30*	*There are many questions in this section, select only enough to meet the needs of the students.*
CYU ***20, 21, 22***	*C28, C18, C30*	*There are many questions in this section, select only enough to meet the needs of the students.*
CYU *23*	*C18*	*Clarification: The formula in this question may be better stated as* $A = 1100m^{2/3}$*, as this allows for an easier understanding of the source of the formula* ($A \sim h^2$, $m \sim h^3$).
CYU ***24, 25***	*C18, C30*	
CYU *26,* ***27***	*C16, C28*	
CYU ~~*28*~~	*C16, C28*	*The formula given is not consistent with context.*
CYU *29*	*C16, C28*	
CYU *30, 31, 32, 33, 34,* ***35***	*C16, C28, C30*	
Chapter Project		

Chapter Three
Exponential Growth

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3.1 A Different Type of Growth

Textbook Items	Outcomes	Notes/Suggestions
Focus A	C2	This focus works well if talked through as is.
FQ **1, 2**	C2, C29, B2	
Investigation # 1	C2, C4	
IQ **3, 4, 5, 6**	C2, C4	To answer 5(b) refer to sequence in 5(a)?
CYU *7*,	C4	
CYU **8**,	C4	This question has many parts, select only enough to meet the needs of the students. Students in the Advanced course should do (h, i, j).
CYU *9*,	C4	Answers in the back of book are wrong; see TR for correct answers.
CYU **10**, *11*	C4	
CYU **12**, *13*	C2	Only one of questions 12 or 13 is necessary to address the outcome.
CYU **14**	C4	
Investigation # 2	C3, C33	Omit Part F
IQ *15, 16*	C4, B2	Questions can be omitted if answers are discussed during in class development.
IQ *17*	C4, C33	Questions can be omitted if answers are discussed during in class development.
IQ *18, 19*	C3	Questions can be omitted if answers are discussed during in class development.
IQ *20, 21*	C33	Questions can be omitted if answers are discussed during in class development.
Focus B Exponential Functions	C2	This makes a good homework activity.
FQ **22, 23, 24, 25, 26, 27, 28**	C2	

Textbook Items	Outcomes	Notes/Suggestions
CYU **29**	C29, A5, C33	This question has many parts, select only enough to meet the needs of the students.
CYU **30, 31, 32**		These questions have many parts, select only enough to meet the needs of the students.
CYU **33**		This questions provides an opportunity to do some algebra.
Investigation # 3	C33	Procedure A— Use Domain that is given in question 35.
IQ **34, 35, 36, 37**		
Focus C		
FQ **38,**	**A5**	Students can be asked to do one of each type or all parts to practise skills.
FQ 39	A5	
FQ **40**	A5	
IQ **41, 42, 43, 44, 45**	C2	
Investigation 4		Note: This is the first time **Domain** is mentioned in chapter.
IQ **46, 47**, *48, 49, 50*	C2	
CYU *51*	A5	This questions provides an opportunity to do some algebra.
CYU **52**	A5	
CYU **52(d)**	A5	
CYU **53, 54**	A5, C2	
Chapter Project		OMIT Part (f)

* **To address A7 teachers need to ask for Domain in set notations in all possible places.**

3.2 Exponential Functions

Textbook Item	Outcomes	Notes/Suggestions
Investigation # 5	C3	Procedures A: Use of technology is recommended.
IQ **1, 2, 3, 4, 5, 6, 7**	C11, C34	
IQ **8**		Opportunity exists here to discuss drug use.
CYU **9, 10, 11, 12**	C11, C3	
Investigation # 6	C3, C2	Not necessary to address outcomes.
IQ *13, 14, 15, 16, 17, 18*	F1	
IQ **19, 20,** *21*	C2	
CYU **22, 23**	C2	Do one of questions 22 or 23 using technology.
CYU *24*	C2, F1	The use of technology is recommended.
CYU *25*	C2, F1	Do question 25 after question 20.
Investigation # 7	F1, A7	
IQ *26, 27, 28, 29*	C34	If question 26 is done as class discussion, then Investigation # 7 is not necessary.
CYU **30, 31**, *32, 33*, **34**	A5, C34, C2, A7	If question 30 is done in class before questions 26, 27, 28, 29, then these questions can be done for homework.
CYU **35,** *36*, **37**	C2	Question 36 makes a good quiz question.
CYU **38**	C2	
CYU *39*	C2	
Investigation # 8	F1	Talk about investigation before giving out the data. Alternative resource — *Pre-Calculus Mathematics One* by McKillop and Kelley, section 9.7.
IQ **40, 41**	C34, C33	

Textbook Item		Outcomes	Notes/Suggestions
IQ	*42*	C34, C33	
CYU	**43, 44, 45, 46**	C34, C33	
CYU	**47**	C11	

3.3 Graphing Exponential Functions

Textbook Item	Outcomes	Notes/Suggestions
Investigation # 9	C35Z, C34, C11	
CYU **1, 2, 3**	C11, C35Z	Question 3 is important to discuss. It can be done for homework.
Focus D Graphing Using Transformations	C11	This can all be done in single class.
FQ **4**	C-11	This makes a good homework question.
Investigation # 10	C34	
IQ **5**	C34	
Focus E More Graphing with Transformations	C34	During this focus students should be asked to complete a full analysis but can sketch the function rather than drawing an accurate graph.
CYU **6, 7**	A7, C 35Z	
CYU **8**	A7, C 35Z	This question has many parts, select only enough to meet the needs of the students.
CYU *9,* **10**	A7, C 35Z	
CYU *11,* **12,** *13, 14, 15*	A7, C33, C34	
CYU **16**	A7, C33, C34	This question has many parts, select only enough to meet the needs of the students.
CYU *17,* **18**, *19, 20*	C2	
CYU *21, 22,* **23**, *24, 25*	C2, C34	
CYU *26,* **27**	C34	

Chapter Three

Exponential Growth

3.4 Number Patterns

Textbook Items	Outcomes	Notes/Suggestions
Investigating # 11	C2, C11	This investigation is not needed to address the outcomes; they are addressed on pages 120-123.
IQ *1, 2, 3, 4, 5*	B12, C24	
IQ *6, 7*	C24	
Focus F Working with Powers	A5	This Focus works well in small groups.
FQ **8, 9, 10**	C24, B1, C25	This is a good place for groups to present answers on the overhead.
CYU **11**, *12,* **13, 14, 15**	C11, C24	Do a few examples here that will bring out the idea of no solutions**.**
CYU **16, 17, 18, 19,**	C24, C25	Some of these questions can be done depending on the amount of practice required by the students. Additional Resource — *Math Is 6* by Ebos and Tuck, pages 168–171.
CYU **20, 21, 22, 23**	C2, C25	This section contains many questions, select only enough to meet the needs of the students, include 20 and 23.
CYU **24, 25**	C2, C25	This section contains many questions, select only enough to meet the needs of the students.

*** This is a good place for a test.**

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3.5 Rational Thinking

Textbook Items	Outcomes	Notes/Suggestions
Investigation # 12	A5	
IQ **1, 2, 3, 4, 5**	B12	These questions have many parts, select only enough to meet the needs of the students.
CYU *6,* **7, 8,** *9*	B12	
CYU **10**	B12	This question makes a good homework activity.
CYU *11,* **12, 13,** *14,* **15**	C24, B1, C2, C11	
CYU *16,* **17, 18,** *19*	C2, C25, C11	A good technology extension could be the use of the TVM solver on the TI-83.
CYU *20,* **21**	C25	
Focus G Laws of Exponents	B12	This focus works well if talked through as is.
CYU **22, 23**	A5, B12, C2	These questions have many parts, select only enough to meet the needs of the students.
CYU **24,** *25*		All of this question should be completed by the students.
CYU **26**		This question should be discussed in class.
CYU **27, 28, 29, 30**	C24	It is recommended that question 35 be completed before question 30.
CYU *31,* **32, 33**	C24	
CYU *34,* **35, 36**	C24	It is recommended that question 35 be completed before question 30.

Exponential Growth

3.6 Going in Reverse

Textbook Items	Outcomes	Notes/Suggestions
Focus H Populations Explosion		
FQ **1, 2, 3**	C2, C19	
FQ **4, 5, 6**	C19	
Focus I Inverses		This focus can all be done in one class plus homework. This focus has many parts, select only enough parts of each section to meet the needs of the students.
FQ **7, 8, 9, 10**	A5	It is recommended that question 10 be completed before question 9.
CYU **11, 12, 13, 14, 15**	A5, B1, B12	This section has many questions, select only enough parts of to meet the needs of the students.
CYU **16, 17**	C19, B1	Do all of question 17.

*** An additional resource for this section is *Pre-cal Mathematics One by* McKillop and Kelley.**

3.7 Laws of Logarithms

Textbook Items	Outcomes	Notes/Suggestions
Investigation 13	B13	For students in the Advanced Course — Start with Question 7 then answer investigation procedures questions. For students in the Academic Course — A class discussion leading students through the investigation may be necessary.
IQ **1, 2, 3, 4, 5, 6**	B13, C24	
IQ **7, 8**	B13	
Focus J Using Laws of Logarithms	C2	Questions 9, 10, 11, 12, 13, and 14 can be done as homework before doing Focus J in class.
CYU **9, 10, 11, 12, 13**	B12, B13, C24	Question 11 has many parts, select only enough to meet the needs of the students.
CYU **14**	B13	
CYU *15,* **16**	C25	
CYU **17**	C25	
CYU **18**	C25	Do this question in class.
CYU **19**, *20,* **21,** *22*	C25	
CYU *23,* **24, *25,*** *26*	C24	
CYU **27**	C2, C25	
CYU *28*, **29, 30,** *31*, **32**	C25	
Focus K Logarithmic Scales	C25	This Focus can be discussed in class or read through by students at home.
FQ **33, 34, 35**	C25	

Textbook Items		Outcomes	Notes/Suggestions
CYU	**36, 37**	C25	This section has many questions, select only enough to meet the needs of the students; making sure a couple of each type is done.
CYU	**38, 39, 40**	C25	This section has many questions, select only enough to meet the needs of the students.
CYU	**41, 42, 43**	C25	This section has many question, select only enough to meet the needs of the students. The answer to question 42 is wrong. Correct answer - 6.1 years.

*** An additional resource for this section is *Pre-cal Mathematic One* by McKillop and Kelley, *Chapter 9* and *Algebra and Trigonometry* by Foerster, page 162, questions 6–14.**

Going 'Round in Circles : Circle Geometry

4.1 Circle Properties

Textbook Items	Outcomes	Notes/Suggestions
Investigation # 1	E5, E7	
IQ **1, 2**	E5, E7	
IQ *3*	E5, E7	
IQ **4, 5,** *6,* **7**	E5, E7, E12	
IQ **8**	E5, E7, E12	This question can be a quiz or journal question.
CYU *9,* **10,** *11*	E7, E12	
Investigation # 2	E5, E7	Do steps A, B, C, D, E, H, and M; steps F, G, I, J, K, and L are redundant.
IQ **12, 13,** *14,* **15**	E4, E5, E7	
CYU *16,* **17**, *18*	E4, E5	
CYU **19, 20**, *21*	E12	
Focus A Congruent Triangles	E5, E11	Give this information using your own method.
FQ **22, 23, 24,**	E11	Additional Resource — *Geometry* by Moise and Downs.
CYU **25, 26**	E11	
Focus B Proofs	E11	
FQ *27, 28*	E7, E11	
CYU **29, 30**, *31, 32*	E7, E11	
CYU *33,* **34(a),** *35*	E4, E7, E11, E15Z	
CYU **36, 37, 38,** *39*	E4, E15Z	

Going 'Round Circles: Circle Geometry

4.2 Circles on a Coordinate System

Textbook Items	Outcomes	Notes/Suggestions
Investigation # 3	E5, E7	
IQ *1, 2, 3*	E5, E7	
CYU **4,** *5*	E5	It is recommended that these questions are done in the following order — 8, 9, 6, 7, and 4 for students in Advanced Mathematics 12 and in this order — 8, 9, and 4 for student in Mathematics 12.
CYU **6, 7**	E5	
CYU **8, 9**	E5, E11	
Focus C Where Are the Washrooms?	D1	Give this information using your own method or have students do this Focus as is for homework.
FQ **10,** *11, 12*	D1	Q10 Also find the midpoints.
FQ **13,** *14, ~~15~~*	D1	Q13 Also find the midpoints.
CYU *16, 17,* **18**	D1, E4	
CYU *19, 20,* **21**	D1	
CYU **22**	D1	
CYU **23**	D1	
CYU **24, 25**	D1	
CYU *26,* **27**	D1	
Focus D Chord Properties in a Coordinate System	D1, E11, E7	This focus is not needed to address the outcomes.
FQ *28*	E5	
CYU *29, 30,* ***31,*** **32**	E4, E15Z	
CYU **33**	D1, E11	
CYU *34,* **35**	D1, E11	

Textbook Items	Outcomes	Notes/Suggestions
CYU **36,** *37*	D1, E11	Question 37 makes a good assignment or quiz question.

Going 'Round in Circles: Circle Geometry

4.3 Angles, Arcs, Tangents, and Sectors (Advanced Mathematics 12 only)

Textbook Items	Outcomes	Notes/Suggestions
Investigation #4	E5, E8Z	Procedures: E, H, J, K can be done as a class activity in approximately 15 minutes.
IQ *1, 2, 3, 4,* **5(a, b)**	E4, E15Z	
IQ **6, 7, 8**(a, d)	E4, E8Z, E5	It is important to bring definitions to students attention.
IQ *9, 10, 11*	E4, E8Z, E11	
CYU **12,** *13,* **14, 15**	**E4, E15Z, E8Z**	
CYU *16, 17*	**E11, E8Z**	
Focus E Proving Relationships	**E5**	This Focus can be read by students focus for homework.
FQ **18, 19,** *20*	E11, E9Z, E8Z, E15Z	
FQ *18(f)*	E11	
FQ *21, 22,* **23**	E15, E9Z	Question 23 requires a class discussion before it is done.
CYU **24,** *25, 26, 27,* **28**(a,b)	E11, E8Z, E15Z	Students in the Advanced Course should do the questions in the following order — 24, 18(a, d), 16, and 33.
CYU *29, 30, 31, 32*	E11, E15Z	
CYU **33**	E11, E15Z, E8Z	
CYU *34, 35, 36, 37*	E11, E15Z, E8Z	
CYU *38, 39*	E15Z, E8Z	
CYU *40, 41, 42*	E11, E15Z, E8Z	
CYU **43**	E15Z, E8Z, E4	

Textbook Items	Outcomes	Notes/Suggestions
CYU *44*	E15Z, E8Z	Correction in TR p. 366 CYU 44(b): $\frac{258^o}{360^o}(\pi)(31.3)^2 = 2206cm^2$
CYU *45, ~~46~~*	E15Z, E8Z	
Investigation # 5	*E5, E8Z, E9Z*	*Starting with Investigation 5, the remainder of this section is optional.* *BLM - Start at E*
IQ ***47***	*E5, E8Z, E9Z*	*BLM*
CYU ***48, 49, 50, 51(a)***	*E4, E15Z, E9Z*	*Questions 48(a) and 49 (a) can be found in the margin.*
CYU ***51(b)***	*E15Z*	
Focus F *Proving Tangent Properties*	*E11, E9Z*	*Give this information using your own method.*
CYU ***52,*** *53, 54*	*E11, E9Z*	
CYU 55	*E11, E9Z*	
CYU 56, 57, 58,	*E11, E9Z*	
Focus G *Tangent Properties in a Coordinate System*	*E5, E8Z, D1*	*Before doing this Focus you may need to review finding the equation of a line using slope and a point on the line.*
CYU 59, ***60, 61, 62***	*E11, E15Z, E9Z*	
CYU 63, ***64***	*E11, E15Z*	
CYU 65, ***66***	*E11, E9Z*	
CYU 67	*E15Z, E9Z*	
CYU 68, 69	*E15Z, E9Z*	
CYU ***70***	*E15Z, E9Z*	

Chapter Four

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Going 'Round in Circles: Circle Geometry

4.4 Transforming Circles (Advanced Mathematics 12 only)

Textbook Items	Outcomes	Notes/Suggestions
Investigation # 6	E4, E13Z	Use the circle on the grid found on page 252 as a handout to save time..
IQ **1, 2**	E13Z, E5	
CYU **3,** *4,* **5,** *6*	E13Z, E4	
Investigation # 7	E13Z	This investigation is not needed to address the outcomes, therefore it is recommended that it be omitted, done very quickly, or done for homework.
IQ **7, 8,** *9, 10,* **11**	E13Z	
CYU **12,** *13, 14, 15*	E13Z	Question 13 can be done if you have students with sports interests in your class.
CYU *16, 17, 18, 19,* **20**	E13Z, E14Z	
Focus H Interpreting Equations of Circles	E13Z, E14Z, E3Z	This information can be given during a class discussion using your own example. The example in the Focus can be reviewed by students for homework.
FQ **21, 22**	E13Z, E14Z, E3Z	This question has many parts, select only enough to meet the needs of the students.
CYU *23, 24*	E13Z, E14, E3Z, E15Z, E11, E4	
CYU **25**, **26,**	E13Z, E14Z, E3Z, E15Z, E11, E4	Change: Only necessary for students in Advanced Mathematics 12.
CYU *27, 28, 29, 30*	E15Z	
CYU *31*	E15Z	
CYU **32,** *33*	E13Z, E3Z	
CYU *34*	E13Z, E3Z	

Textbook Items	Outcomes	Notes/Suggestions
Focus I Using a Graphing Calculator to...	E3Z, E13Z	This focus is not needed to address the outcomes. The work required to put the equation in transformational form is not worth it.
FQ **35,** *36*	E3Z	Do question 35(b) in class as an example.
Focus J Equations in Transformational Form	E3Z	
FQ **37, 38,** *39*	E3Z	
FQ **40, 41**	E3Z	Change: Only necessary for students in Advanced Mathematics 12.
Investigation # 8	E3Z, E16Z	After Part D, complete the questions without graphing.
IQ **42, 43, 44**	E3Z, E16Z	
IQ *45, 46, 47*	E16Z	
CYU **48, 49**	E3Z, E16Z	
CYU **50, 51**	E15Z	

4.5 Examining the Circle as a Trigonometric Function *(Omit)*

Textbook Item	Outcome	Notes/Suggestions
Investigation # 9	*C36Z*	*This investigation is necessary to address outcome C36.*
IQ 1, 2, 3, 4, 5	*C36Z*	
Focus K Finding From a Point (cos, sin)	*C36Z*	
CYU 6, 7, 8, 9, 10	*C36Z*	*This information is covered in Mathematics 11 and Advanced Mathematics 11and therefore can be covered quickly; noting new terminology such as terminal arm and related angles.*
CYU 11, 12, 13, 14, 15	*C36Z*	
Investigation # 10	*C37Z*	.
CYU ***16, 17, 18, 19***	*C20Z, C37Z*	*This section has many questions, select only enough to meet the needs of the students.*
CYU ***20, 21, 22***	*C20Z, C37Z*	*This section has many questions, select only enough to meet the needs of the students.*
CYU ***23, 24, 25***	*C20Z*	*This section has many questions, select only enough to meet the needs of the students.*
CYU ***26, 27***	*C20Z*	*This section has many questions, select only enough to meet the needs of the students.*

Going 'Round in Circles: Circle Geometry

Practise

Textbook Page and Item	Description	Notes/Suggestions
P. 297 - Question 22(c)	Rewording	"**Write the mapping rule that maps the unit circle to this circle**."
	Correction in TR p. 440	A circle is obtained **from the unit circle** by the mapping rule: (x, y)→**(7x + 3, 7y - 5)**
P. 297 - Question 22(d)	Rewording	**Stretch this circle horizontally into an ellipse, where the major axis is twice as long as the minor axis. What is the equation of the ellipse?**
	Correction in TR p. 440	The equation of the ellipse is: $\left[\frac{1}{14}(x-3)\right]^2+\left[\frac{1}{7}(y+5)\right]^2=1$
P. 297 - Question 23(d)	Rewording	**Stretch the original circle into an ellipse, where the major axis is five times as long as the diameter of the original circle, and the minor axis is three times as long as the diameter. What mapping rule would describe this?**
	Correction in TR p. 440	The mapping Rule is: $(x,y)\rightarrow\left(\frac{1}{5}x,\frac{1}{3}y\right)$
P. 297 - Question 23(e)	Rewording	**What is a possible equation of the ellipse?**
	Correction in TR p. 440	One possible equation is: $\left[\frac{1}{21}(x+4)\right]^2+\left[\frac{1}{35}(y+6)\right]^2=1$

Chapter Five

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Probability

5.1 Probability and Quantifying the Outcomes

Textbook Item	Outcome	Notes/Suggestions
Focus A Probability	G2	
FQ **1, 2**	G2	
CYU **3, 4, 5**	G2	
CYU **6**	G2	Change: Only necessary for students in Advanced Mathematics 12.
CYU *7, 8*, **9,** *10*, **11**	G2, G1	This section has many questions, select only enough to meet the needs of the students.
Investigation # 1	G1	Both Investigation 1 and Investigation 2 are not needed to address the outcome.
IQ *12, 13*	G1	
Investigation # 2	G1	Both Investigation 1 and Investigation 2 are not needed to address the outcome.
CYU **14**, *15, 16*	G1	

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5.2 Counting and Probability

Textbook Items	Outcomes	Notes/Suggestions
Investigation # 3	G3, G4	
IQ **1, 2**	G3	
CYU **3, 4, 5, 6, 7**	G3, G4	
CYU **8, 9**	G3	
Focus B Applying the Fundamental Counting Principle to Probability	G3	
CYU **10, 11, 12**	G3	
Investigation # 4	G3	
IQ **13, 14, 15**	G3	
CYU **16, 17, 18, 19, 20**	G3	
Investigation # 5	G3	
IQ **21, 22, 23, 24**	G3	
Investigation # 6	G3	This can be homework. Correction in TR p. 473 — In Part 2, the events M and N are mutually exclusive, so **P(M or N)** is equal to P(M) + P(N).
IQ **25, 26, 27, 28, 29**	G3	This is the first time in high school Venn Diagram are introduced, however, they are not required to cover an outcome.

Textbook Items	Outcomes	Notes/Suggestions
Focus C The Addition Principle	G3	Correction in student text — P(A or B) = 190/ 200 or 0.95
FQ **30, 31**	G3	
CYU **32, 33, 34, 35**, *36*	G4, G3	Question 35 has many parts, select only enough to meet the needs of the students.
Focus D Area Models and Probability, Part 1	G4, G3	When presenting the Area Model in Focus D cut graph at 15 and 20.
FQ **37, 38, 39, 40**	G4, G3	
Investigation # 7	G4, G3	see note Focus D advance only
CYU **41**, *42, 43, 44*, **45**	G4, G3	Question 43: Rewording - Suppose that all meteorites are equally likely to strike any part of the Earth. **For the next meteorite that hits the Earth, calculate the probability of each event**" Question 45: Correction in TR p. 482 - Answer should be 1/ 4. The explanation is correct.
Focus E Calculating conditional Probability	G5Z, G4, G3	
FQ **46**	G5Z, G4, G3	
CYU **47, 48, 49, 50**, *51*	G5Z, G4, G3	
Investigation 8	G5Z, G4, G3	
IQ **52, 53, 54, 55, 56, 57**	G5Z, G4, G3	

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5.2 Counting and Probability (con't)

Textbook Items	Outcomes	Notes/Suggestions
CYU **58, 59, 60**	G5Z, G4, G3	
Investigation # 9	G5Z, G4, G3	
IQ **61**, *62*	G5Z, G4, G3	
CYU **63, 64, 65,** *66*	G5Z, G4, G3	

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5.3 Combinations and Permutations

Textbook Items	Outcomes	Notes/Suggestions
Investigation # 10	G7	Hint to help students figure out whether to use a permutation or combination — Since 'o' is next to 'p' in the alphabet, if 'o'rder matters then 'p'ermutations are needed.
IQ **1, 2**	G7	
CYU **3, 4, 5, 6, 7**	G7	
Focus F Factorial Notation	A6	
CYU **8, 9**	A6	
CYU **10**	A6	
CYU **11, 12**	A6	
CYU **13, 14**	A6	
Investigation # 11	G8	
IQ **15**	G8	
CYU **16, 17, 18, 19, 20**	G8, G7	
Focus G Determining the Number of Possible Combinations	G8, G7, A6	Information: While both ${}_nC_r$ and $\binom{n}{r}$ notations are valid, the $\binom{n}{r}$ notation is more widely used by mathematicians and statisticians.
CYU **21, 22, 23, 24**	G8, G7	
CYU **25, 26, 27,** *28*	G8, G7	
CYU *29*	G8, G7	

Textbook Items		Outcomes	Notes/Suggestions
CYU	**30, 31, 32**	G8, G7	
CYU	**32(c)**, *33*	G8, G7	
CYU	**34**	G8, G7	

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5.4 Combinations, Permutations, and Probability

Textbook Items		Outcomes	Notes/Suggestions
Focus H Applications to Probability		B8, G8	
FQ	**1**	B8, G8	
CYU	**2, 3, 4, 5**	B8, G8	
CYU	**6, 7, 8, 9(a, b)**	B8, G8	
CYU	**9(c), 10(a, c), 11, 12**	B8, G8	
CYU	**13, 14, 15**	B8, G8	

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5.5 Applying Probability and Combinations to the Binomial Expansion (Advanced Mathematics 12 only)

Textbook Items	Outcomes	Notes/Suggestions
Investigation # 12	G10Z	
CYU **1, 2**	G10Z	
Investigation # 13	G10Z	The use of the BLM in the TR is recommended.
IQ **3**	G10Z	
CYU **4, 5, 6,**	G10Z	
CYU 7	G10Z	Clarification: It is important to distinguish between conjectures that can be made by looking at some examples and formal proofs. Rewording: "**Show that each identity below holds for the triangular array you made using combinations. Prove each identity.**"
CYU **8**	G10Z	
Investigation # 14	G10Z, G9Z	
IQ **9, 10**	G10Z, G9Z	It is recommended that question 14 be completed before question 9.
CYU **11, 12, 13, 14**	G10Z, G9Z	It is recommended that question 14 be completed before question 9.
Focus I Raising Polynomials to Any Power	G10Z, G9Z	
FQ **15, 16**	G10Z, G9Z	
CYU **17, 18, 19, 20, 21, 22**	G10Z, G9Z	

5.6 Binomial Probabilities *(Omit)*

Textbook Items	Outcomes	Notes/Suggestions
Investigation # 15	*G11Z, G1*	*Alert: Investigation # 15 and Focus J should not be used in their present form. Either identify and use another introductory context before proceeding with Focus K or omit Section 5.6 at this time. The latter would imply omitting SCOs G11Z and G12Z from the curriculum guide.*
IQ 1, 2, 3	*G11Z*	
Focus J A Theoretical Model for the Hiring Problem	*G1, G11Z*	
FQ 4, 5, 6, 7	*G11Z*	
CYU 8, 9, 10, 11	*G1*	
Focus K Probability and Binomial Experiments	*G11Z, G12Z*	
CYU 12, 13, 14, 15	*G11Z, G12Z*	
CYU 16, 17, 18, 19, 20	*G11Z, G12Z*	*Question 20 requires logarithms to complete properly.*

Chapter Five
Probability

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Review

Textbook Page and Item	Description	Notes/Suggestions
P. 355 - Example 4	Rewording	Based on this, what is the probability that rain **is falling but** not affecting the east side?"

Recommended Resource List
Grade 12 Academic /Advanced

Each Student Should Have:

RESOURCES	AVAILABILITY	COST
Mathematical Modeling, Book 3	**ALR**	**$32.00ea.**
Orchard Hideout **(Optional)**	**ALR**	**$8.00ea.**
TI-83 Calculator (Ideally each student should have one calculator to use in class and at home)	**ALR**	**$1360.00 (10 pack)**

Each Teacher Should Have:

RESOURCES	AVAILABILITY	COST
Mathematical Modeling, Book 3 Teachers' Resource	**ALR**	**$70.00 ea.**
Orchard Hideout, Teachers' Guide **(Optional)**	**ALR**	**$26.00 ea.**
Atlantic Canada Mathematics Guide: Mathematics 12 /Advanced Mathematics 12	**Dept. of Ed.**	**free**
TI-83 with View screen or Presenter	**ALR**	**$522.25 ea.**
Alge-Tiles Resource Binder	**ALR**	**$30.95 ea.**
Alge-Tiles Overhead or Magnetic Set	**ALR**	**$29.95 or $34.50**

Every Classroom Should Have:

RESOURCES	AVAILABILITY	COST
Alge-Tiles **One x set per two students** **One y set per two students**	**ALR**	**$175.00 (set of 15 incl. binder)** **$10.00 ea.**

Every School Should Have:

RESOURCES	AVAILABILITY	COST
Calculator-Based Ranger System (CBR) - 8	**ALR**	**$141.27 ea.**
TI-Graph Link Software and Cable - 1	**ALR**	**$95.00 ea.**